



Research Article

OPTIMIZING THE REQUIREMENT OF POTASSIUM AND CALCIUM IN RAINFED GROUNDNUT OF POLLACHI TRACT

VASUKI V.*

Controllorate of Examinations, Tamil Nadu Agricultural University, Coimbatore, 641 003, India

*Corresponding Author: Email - vasukimani@gmail.com

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Abstract: Field experiments were conducted at Coconut Research Station, Aliyarnagar during *kharif* 2009, 2010 and 2011 to optimize the dose of potassium and calcium requirement. Soil was sandy clay loam with low organic carbon, low available nitrogen, high available phosphorus and low available potassium and neutral pH. Experiment was laid in Factorial Randomized Block Design with three replications, plot size was 20 m² (4 x 5 m²). Three factors with Factor - A Gypsum application - as basal (100 %) and in splits (50 % basal and 50 % as top dressing on 45 DAS), Factor B - Potassium three levels 25, 50, 75 kg ha⁻¹ and Factor C - Calcium 50, 100, 150 kg ha⁻¹ applied as 100 % basal. Recommended doses of nitrogen and phosphorus (10:10 kg ha⁻¹) applied as basal. Groundnut variety TMV 13 was used with spacing of 30 x 10 cm². Results revealed potassium @ 75 and 50 kg ha⁻¹ and calcium @ 150 and 100 kg ha⁻¹ recorded significantly maximum pod yield. Among different methods of application of gypsum there were no significant difference, hence it can be applied either 100 % as basal or split application (50 % basal and 50 % top dressing on 45 DAS).

Keywords: Potassium, Calcium, Gypsum, Basal application, Split application, Groundnut

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Introduction

Groundnut is one of the most important sources of vegetable protein. The seeds contain high quality of edible oil (50 %), protein (25 %) and carbohydrates (20 %). The productivity of groundnut is comparatively low in our country due to various edaphic factors. The rainfed groundnut especially receives poor nutrient due to hike in fertilizer rates and instability in rainfall. In Coimbatore district, major groundnut area is in Pollachi Taluk which is around 738 hectares of which 60 % is rainfed. Besides the two normal seasons, monsoon and summer the special feature of this tract is raising exclusive rainfed crop in the pre monsoon season which is normally sown on 15th April. The balanced nutrient application will improve the productivity of rainfed groundnut. Fertilizer to any crop acts as a growth promoter. The application of potassium improved the crop harvest index and grain quality parameters of boldness, protein and oil contents [1]. The pod and oil yields of groundnut was highest with 60 kg of potassium [2].

Application of Gypsum upto 495 kg ha⁻¹ increased yield and reduced the number of "Pops" [3]. The application of gypsum has significantly improved the yield attributes of groundnut. The application of gypsum improves the filling and strengthening of pods [4]. Gypsum application of 400 kg ha⁻¹ was found to give better yield of groundnut when compared to 0 and 200 kg ha⁻¹ [5]. Field experiment was formulated to optimize the requirement of Potassium and Calcium along with time of application either all dose as basal or half dose basal and half dose top dressing in order to improve the yield of rainfed groundnut in Pollachi tract of Tamil Nadu.

Materials and Methods

Field experiment was conducted at Coconut Research Station, Aliyarnagar during *kharif* 2009, 2010 and 2011. The soil was sandy clay loam for with low organic carbon. Soil nutrient status was low available nitrogen, high available phosphorus and low available potassium with soil EC of 0.07 dSm⁻¹ and pH of 7.5. The experiment was laid out in Factorial Randomized Block Design with three factors

namely, Factor I Potassium levels (3) 25, 50, 75 kg ha⁻¹; Factor II Calcium levels (3) 50, 100, 150 kg ha⁻¹ Factor III (2) – Gypsum methods of application (100 % Basal, 50 % basal + 50 % top dressing at 45 DAS) with three replications. Potassium was applied through Muriate of Potash (K₂O) and Calcium through gypsum (CaSO₄). The plot size adopted during all the three years was 20 m² (4 x 5 m²). For nitrogen and phosphorus recommended dose of N P (10:10 kg ha⁻¹) was applied as basal. Groundnut variety TMV 13 was used for experimental purpose, with spacing of 30 cm x 10 cm. The growth and yield data recorded were statistically analysed for significance and tabulated [Table-1].

Results and Discussion

The results of field experiments conducted at Coconut Research Station, Aliyarnagar during *kharif* 2009, 2010 and 2011 were statistically analysed for significance and tabulated. The interpretation of results along with discussion detailed below

Biometric Observations

Plant height (cm) and no. of branches

The plant height recorded at harvest showed no significant differences among different levels of potassium, calcium and methods of application. The maximum plant height of 47.56 cm to the lowest plant height of 44.9 cm was recorded among the treatments. The number of branches recorded at harvest was also non-significant among treatments and that recorded the highest number of branches of 5.65 to lowest number of branches of 5.46.

Yield Attributes

The 100kernel weight (g) recorded no significant differences among the treatments and ranged from 35.09 to 33.93 g. The shelling percentage recorded significant differences with different levels of potassium and highest shelling percentage of 68.06 and 69.55 was recorded potassium 50 and 75 kg ha⁻¹.

Table-1 Effect of different Potassium and Calcium combinations on growth and yield parameters of rainfed groundnut

Treatments		Plant height at harvest (cm)	No. of branches at harvest (Nos.)	Shelling Percentage	100 kernel weight (g)	SMK (Nos.)	Pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Harvest Index
K ₁ - 25 kg ha ⁻¹ K ₂ O		44.06	5.61	64.79	34.01	83.21	2245	3512	0.259
		45.84	5.46	68.06	33.93	85.19	2528	3705	0.271
		47.56	5.63	69.55	35.09	87.34	2790	3953	0.287
SEd		1.55	0.23	1.26	0.70	0.90	68.42	101.02	0.005
CD (P=0.05)		NS	NS	2.56	NS	1.84	186.67	205.39	0.011
C ₁ - 50 kg ha ⁻¹ Ca		44.90	5.58	66.59	33.99	83.61	2420	3618	0.267
		46.08	5.65	67.74	34.12	85.39	2527	3729	0.274
		46.49	5.48	68.04	34.93	86.84	2601	3824	0.277
SEd		1.56	0.23	1.26	0.70	0.90	68.42	101.02	0.005
CD (P=0.05)		NS	NS	NS	NS	1.84	139.10	NS	NS
A ₁ - 100 % Basal		45.49	5.58	67.43	34.32	85.25	2494	3721	0.270
	A ₂ - 50 % Basal +50 % on 45 DAS	46.15	5.56	67.49	34.37	85.30	2538	3726	0.275
SEd		1.27	0.19	1.03	0.57	0.74	55.86	82.48	0.004
CD (P=0.05)		NS	NS	NS	NS	NS	NS	NS	NS
KC	SEd	2.69	0.396	2.18	0.99	1.57	118.5	174.97	0.009
	CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
CA	SEd	2.19	0.324	1.78	1.22	1.28	96.76	142.86	0.008
	CD(P=0.05)	NS	NS	NS	NS	2.60	NS	NS	NS
KA	SEd	2.19	0.324	1.78	0.99	1.28	96.76	142.86	0.008
	CD(P=0.05)	NS	NS	NS	NS	NS	290.70	NS	NS
KCA	SEd	3.80	0.56	3.09	1.72	2.21	167.59	247.45	0.013
	CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Different levels of calcium and methods of application recorded no significant difference among treatments for shelling percentage. Significant differences were recorded with Sound Matured Kernels (SMK) for different levels of Potassium, Calcium and methods of application. The application of calcium and sulphur through gypsum significantly improved the yield attributes of groundnut. The application of gypsum improves the filling and strengthening of pods and conformity results were also obtained [6]. Potassium application @ of 75 kg ha⁻¹ recorded 87.34 numbers of SMK followed by potassium application of 85.19 numbers of SMK. Application of calcium @ 150 kg ha⁻¹ recorded significantly higher SMK of 86.84 numbers followed by 100 kg ha⁻¹ with 85.39. Among methods of application split application there were no significant difference among treatments for SMK.

Yield

Pod and haulm yield (kg ha⁻¹)

Highest dry pod yield 2790 kg ha⁻¹ was recorded with application of potassium @ 75 kg ha⁻¹ followed by potassium 50 kg ha⁻¹ with 2528 kg ha⁻¹. The pod and oil yields of groundnut was highest with 60 kg of potassium application and in line with the results obtained [7]. Application of calcium @ 150 kg ha⁻¹ recorded significantly higher yield of 2223 kg ha⁻¹ followed by calcium @ 100 kg ha⁻¹ with dry pod yield of 2527 kg ha⁻¹. Among different methods of application, 100 % as basal and split application 50 as basal and 50 % as top dressing on 45 DAS recorded no significant difference. Application of calcium increased pod yield and reduced the number of "Pops" by increasing the sound matured kernels [8]. Haulm yield recorded showed significant differences among different levels of potassium application @ 75, 50, 25 kg ha⁻¹ while calcium application @ 150, 100, 50 kg ha⁻¹ and different methods of application viz. 100 % basal and 50 % basal and 50 % top dressing at 45 DAS showed no significant differences. Haulm yield recorded with 75 kg ha⁻¹ of potassium was 3953 kg ha⁻¹ followed by potassium @ 50 kg ha⁻¹ with 3705 kg ha⁻¹.

Harvest Index

The harvest index recorded with different levels of potassium 25, 50, 75 kg ha⁻¹ recorded significant difference among treatments. The highest harvest index of 0.287 was recorded with potassium application level of 75 kg ha⁻¹ followed by 0.271 with potassium @ 50 kg ha⁻¹. The application of potassium improved the crop harvest index and grain quality parameters of boldness, protein and oil contents and results obtained were in accordance [9].

Conclusion

Potassium application @ 75 kg ha⁻¹ recorded highest pod yield of 2790 kg ha⁻¹ followed by Potassium application @ of 50 kg ha⁻¹ with a yield of 2528 kg ha⁻¹ of groundnut. Calcium application @ 100 and 150 kg ha⁻¹ recorded the highest pod yield of 2527 and 2601 kg ha⁻¹. Among the methods of application there were no significant difference hence it can be applied as either 100 % as basal or split application (50 % basal and 50 % top dressing). The interaction effects were non-significant.

Application of research: Optimizing the potassium and calcium levels along with time of application will help in appropriate use of resources along with increasing the yield in rainfed groundnut of Pollachi tract.

Research Category: Nutrient management in groundnut

Abbreviations: DAS-days after sowing

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****Principal Investigator or Chairperson of research: Dr V. Vasuki**

University: Tamil Nadu Agricultural University, Coimbatore, 641 003, India

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Study area / Sample Collection: Coconut Research Station, Aliyarnagar, Pollachi Taluk, Coimbatore, Tamil Nadu

Cultivar / Variety / Breed name: TMV 13

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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